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Vol. 65, No. 18, Pages 337 - 3-14

levela, below the caularon complex. Special foaruran of Sew Hamico camelatons lotiude mound outflow shears; soning may be persel (most silicatus at the boliva) or reversed. Year-artiption potensium melasomatina may mank some chained trands. The largest raularons of mourbwesters has kenico tend to occur in Chatters, interprised as surface appressions of hasied composites plutons (a.g., Mogolian Piersen). To marry misse of development, or on the Irings of a closial, coniderous cand to be asymmetried tragdoor erructures, finand by rapeated small oruprious amparated by quiescoht periods. During the holght of activity, cauldions lormed by successions. The youngest inown cauldron is shellum and resulted trom asymmetrical subsidence and collepse of calders walls.

J. Goophys. Res., S. Faper 450414

THE GEORGIAY OF BACKARC PRINTING ALONG THE RASTERM SHEMA ARC, EMORASIA: COSTRAINTS FROM EARNESS AND GRAVETT DATA

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Frank J. Spare (Bapr. of Geol. & Goophys., Princoing
University, Princeton, NJ, 08344) Fresk J. Spare (Bapr. of Geol. 1 Geophys., Princolna University, Frinceton, NJ. 6314)
An understanding of the dynamics of magne withdrawed is essential to reconstruction of incapsive veriables in magne stearwidts. Important persentes governing the autent of subtermean magne string [Indiced by withdrawel] include the verticel structure of density and viscosity, discharge, size and shape of the chember, may very par. A commercal model to study isoutance magne withdrawel From a Cantrel vertice conduit as a Sunction of the Reynolds number, the traservoir re conduit width satie, reservoir super rotio [width/depth], and diffaring kimmatic boundary rondirions is presented. Both open [angua resharge) sed closed (calders collapse) ayeres are considered. Fister difference solutions to the vorticity frameport and Folson equations suchies determination of vorticity, arreas lumation, and velocity tiside as a function of time. Output includes stream Fenction specials respectively and evacuation isochem alagrams. An ovecession shocker with both the magne percels slong a given includes change percels slong a given includes change for the magnetic content.

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INTERNAL GENIOSY AND EYOLUTION OF THE REDDING ODME,
YALLES CALDESA, MEN MEXICO
D. L. Stalson and J. S. hulen (ESTIN Science Leborstory, University of Utah Research institute, Sait
Lake City, Utah, 84109)
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May 1, 1981

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Space Environment Laboratory

The National Oceanic and Atmospheric Administration's (NOAA) Space Environment Laboratory (SEL), along with several other NOAA programs, is slated for a major hadget reduction in FY 1985, a reduction which would have a serious impact upon the space environment services now provided by the

laboratory.
SEL joindy with the U.S. Air Force's Air Weather Service, operates the Space Environment Services Center (SESC) in Boulder, Colorado. SESC acquires, in near real-time, world-wide data on solar activity, on the terrestrial magnetic field, and on energetic particles at geostationary and polar orbiting sal-ellite altitudes. Data are available to SESC from solar observatories operated by both the Air Force and a number of nongovernment organizations, die NOAA geostationary and polar orbiting satellites, and a U.S.-Canadian netometer network.

Incoming digital data are processed in a dedicated computer system and displayed at the SESC forecast console where personnel issue forecasts and warnings of significant solar and geomagnetic activity to a wide variety of users. The data are available via computer-tocomputer links, and forecasts and warnings are being distributed without delay using a commercial satellite broadcast system. Additionally, a synopsis of current geomagnetic and solar activity is broadcast on WWV-AM shortwaye at 18 min past the hour, and is available via recorded phone message from SESC. Solar-geophysical data summaries are published weekly.

Are You Investing

in AGU's Future?

A tabulation of the various levels of

contribution to die AGU-GIFT program

indicates the number of members who

have been "investing in the future of

AGU." More than 6,000 members have

contributed to this appeal. Can you find

your place in the matrix? The members of

the Sicering Committee for this program are very appreciative of your response and support. We thank each and all of

The major support has come from the Individual Supporting Members and the Life Supporting Members. The lists of these donors have been increasing each

year, almost doubling in number this year.
More than 8,000 have now accepted the
"voluntary contribution of \$10" as shown

on the annual dues invoices, and we are

encouraged that so many have done this

for 3 successive years. Those who made

year should plan ahead. The appeal will continue until 1986.

The record keeping for this financial

campaign would seem to be a natural for the computer, but the system was not de-

April 18, 1984

28,164 22,251 8,042 17,309

21,162

16,293

\$24,336.

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\$206,746 \$12,228

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Number of participants by accumulated contributions (including pleages).

Total participants 6,463.

29,173 25,452 6,542

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this contribution for the first time this

Editorial

This real-time operation is supported by technique development efforts in SEL's Re-search Division. The division recently has implemented semi-automatic synoptic mapping of the global solar magnetic fields, as well as statistical maps of the total energy input into the polar region by energetic particle precipitation as measured by instruments aboard the NOAA/TIROS salellites.

The Systems Support Division is responsi-ble, along with NOAA's satellite operations element (National Environmental Satellite. Data and Information Service), for the design and procurement of the space environment monitors on the two NOAA satellite systems, COES and NOAA/TIROS. Recently, the division successfully demonstrated in the laboratory a prototype X ray imager designed to supply real-time X ray images of the sun. It hoped such operational monitors can be

flown on satellites by the 1990's. In other developments at SEL, a new data base system, SELDADS II, has been procured and should be on-line by late 1985. Using a Data General MV10000 computer, the system will enhance SEL's capabilities to store and analyze the real-time data stream and will be

able to run improved forecasting models. The proposed budger reduction will impact upon SEL operations in a number of ways: Supporting technique development efforts for improving services will be lost; the pre-sent 24 hours per day forecast/warning schedule will be recluced to an 8 hour per day, 5 days per week operation; support for the satellite systems will be decreased, with the possible loss of the solar X ray imaget sys tem; the SELDADS II implementation will be delayed; and, the number of space environment products will be decreased, including a cutback in both the weekly "Preliminary Re-

signed for such an effort. So, the Commit-tee has had to improvise, or, in other

investments as best we can at little or no

words, maintain a record of the individual

cost to the investor. We did ask the master

system to produce sets of mailing labels

for the full membership; that is, one set

for each Section. Each computer primous

fold contains 48 of these sticky labels. An

investment record is maintained on a 4" x 6" card, with a pulled label attached for

identification and for alphabetic filing, a file for each Section. A beautiful byprod-

uct of this manual system is the hard copy residue of the unpulled labels (i.e., those

This particular feature—the record of

nonparticipants—gives us much concern. We know that many of the younger mem-

bers and some of those enjoying retre-ment are not able to help; however, when we look at the labels still on the master

printout we see names of many members

who have benefitted and continue to benefit from their membership in AGU. They

are receiving dividends—even compound ed—by virture of their many years of

membership. For those of you whose la-

bels we have not pulled and are able to

relp, we ask dust you look again at your

your role in this program.

A few of our members are employed by

AGU-GIFT Program as of April 16, 1984

relationship with AGU and reconsider

243

216

416 154 907

who have not been able to invest).

December 9 10 14 15 16 17 18 17 18 17 18 17 18 19 20 21 22 23 24 25 28 27 28 29 30 31 attend plan to attend

December 1984 AGU **Fall Meeting ASLO Winter Meeting**

Civic Auditorium, San Francisco

- Larger Than Ever ■ More Exhibitors
- **■** Poster Sessions
- **■** Convenient Housing

For Details See April 24 EOS

port and Forecast of Sular Ceophysical Data" publication, and the space environment sumies on the WWV broadcasts.

Thu news item was contributed by William J. Brennan, Public Affairs Officer, National Ocean-ir and Atmospheric Administration, Environmental Research Laboratories, Boulder, CO 80303.

Ocean Drilling Suggestions

The Ocean Drilling Program replaces the recently completed drilling phase of the Deep Sea Drilling Project (DSDP). A new and larger theep sea drilling vessel with expanded ca-

corporations that practice marching gifts

f their employees. We extend a double

thanks to those members who have asked

their employers to match. One corpora-tion double matches, so a triple thanks is

endeavor to convince them that AGU

due. If you are employed by a corporation

that contributes to educational institutions,

merits support for its program of continu-

Those of us who are U.S. citizens re-

cently submitted statements to the IRS

Through the personal deduction process

for contributions—or those "Investments in AGU"—the federal government be-comes a participant in the GIFT program

with a form of marching. In the same way,

many of the state governments are also

participating, It is simple: The greater your deductions, the greater their particlpation. So the bottom line is, What you "invest In AGU" will bring multiple dividends, a greater financial reserve for the

Union and lower taxes for you. Thank us,

Charles A. Whitten

ACU CIFT Fund

Steering Committee

Go-Chairman

1,524

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identifing diridends and contributions

along with other related Information.

pabilities including a longer strill string, bare cock sputlin, enhanced logging, and the po-tential for riser drilling will replace the D/V Glonar Challenger, Drilling is scheduled to commence in January 1985, and planning is now underway for the tenutive schedule
shown below. The strill ship will then proceed to the Pacific Ocean and circumnavigate the earth at least twice during the 10-year program. Suggestions for strilling objectives, slownhole experiments, etc., for all areas worldwide are now being sufficient by JOIDES Join Oceanigraphic Institutions for Deep Earth Sampling).

Suggestions for use of the drill ship are re-

viewed by the JOIDES science advisory struc-ture, which includes three thematic and five regional panels and four service panels. The advisory structure is supplemented as required by specialized working groups and task groups. Approved objectives will be inte-grated into the drilling program by the Plan-ning Committee under the direction of the IOIDES Executive Committee.

JOIDES is also seeking persons with scientilic or technical expertise to serve on advisosy panels for approximately 2 year terms. Anyone wishing to be considered should send his or her vita to the JOIDES office.

JOIDES is an international organization made up of ten U.S. academic institutions and the science agencies of other member countries which presently include Gauada, France, the Federal Republic of Germany, Ja-pan, and the United Kingdom, Support for the Ocean Drilling Program is provided by the U.S. National Science Foundation, the Department of Energy, Mines and Resources of Ganada, the Gentre National pour l'Exploiration des Oceans of France, the Bundesanstalt für Geowissenschaften und Rohstoffe of the Federal Republic of Germany, the Natural Environment Research Council of the United Kingdom, and the European Science Foundation representing Italy, The Nether-lands, Norway, Sweden, and Switzerland. Participation in the Ocean Drilling Program and science advisory structure is open to anyone, and is not limited to representatives of JOIDES institutions or member countries. Drilling suggestions and proposals should be submitted to the JOIDES office, Rosenstiel School of Marine and Almospheric Science, University of Miami, 4600 Rickenbacker Causeway, Miami, FL 33149 (telephone: 305-

This news item was submitted by Donald S. Marszalek, JOIDES Science Coordinator, Miami,

Tethered Satellite Opportunity

The National Aeronautics and Space Adninistration (NASA) and the Piano Spaziale Nazionale of the Consiglio Nazionale Delle Ricerche of Italy (PNSCNR) are inviting re searchers to participate in the first three flights of the Tethered Satellite System (TSS) on the space shuttle. The Tethered Satellite, a joint Italian/U.S. project, will deploy experiments in space at a distance of up to 100 km from the shuttle orbiter. Science instruments will remain tethered either upward or downward from the vechicle for approximately 16 hours at a time before being "reeled" back in. The first three missions, scheduled between 1987 and 1990, will conduct experiments primarily in the areas of space plasmn, atmospheric, geomagnetic, and earth gravity phys-

Letters of intent to submit an investigation are due at NASA or CNR by May 21, 1984. Proposale, itcluding details on investigation and technical plans, management, and cost, are due by July 20, 1984. Those who wish to receive a copy of the full Announcement of Opportunity (A.O. No. OSSA-1-84) should write Robert D. Hudson, Mail Code EE. NASA Headquarters, Washington, DC 20546,

News (conl, on p. 346)

Solar Max: Three Hits, One Save. . .

In the end it was all smiles and congratulations, but the crew of the space shuttle Chal-lenger and NASA engineers in Houston and at the Goddard Space Flight Center in Greenbelt, Mil., were not Torgetting how close the Salar Maximum (Solar Max) satellite repair mission had come to being the Solar Max destruction mission. In fact, if it had not been for a late night resuscitation effort by a ream of engineers at Goddard and a particularly providential sunrise, the shuttle crew might never have gotten their hands back on the \$200 million orbiting solar observatury after a docking attempt on the mission's third day knocked it out uf kilter. As it is, thanks to the astronauts' skilled repair work, the satellite is now ready for another 6 years or more

of sun watching.

Solar Max had been stranded in space since 1980, the victim of blown fuses in its attitude cuntrol system that left four of its seven science instruments without accurate pointing eapability. Shortly after the blow mit, Godtlard technicians had put the satellite in a show, "coming" spin to keep its solar panels pointing at the sun and the batteries charged un. In this holding pattern, turning at the rate of 1° per second, the first satellite designed to be reserviced in arbit had awaited its reschers for more than 3 years.

Challenger and its tepair crewwere lannehed on April 6, 1984. The trouble started two days later, when astronaut George Nelson tried to dock with Solar Max and steady it so that it could be picked up by the shuttle's long mechanical arm. Three times he tried to mate a cylindrical attachment device to a trimunion pin protruding from the sateline's midsection, but three times he bonned away without the decice locking (the problem, it now appears, was with a small stud next to the pin that did not show up in engineering bluepoints).

Forum

Child Care at National Meetings

Is your participation in AGU meetings limited by the lack of child care facilities? Would you be willing to pay for such services? The AGU Education and Human Resources Committee surveyed a sample of members, and our findings were inconclusive. If your meeting attendance clepends on the availability of daycare, please write a brief note to that effect, and send it to the committee at AGU Headquarters. If response to this request is sufficient, this committee will recommend that some

> Louise Levien Member, AGU Education and Human Resources Committee

Geophysical Weight Loss Diet

Having for numerous reasons acquired three digit kilogram mass, the author is experienced at the painful struggles that the gonrmand must suffer to reduce weight, particularly if he/she enjoys reasonably large amounts of good fund. To the avant-garde geophysicist, utilizing the following approach could be pleasurable.

Up until this time, Solar Max had been

succesful attempt to steady the satellite by

grahbing anto one of its winglike solar pan-

rewarding, and may even enable the ishment of what Ghengis Khan, Alexander the Great, Napolean, and Hitler could not

The basic approach is the full milization of Newton's formula for the attraction of two massive bodies: F=GM Mde, where G, is the gravitational constant; r. the distance between the two bodies; and M1 and Mz, the masses of the two bodies. Although one usually chooses Ali to be the earth's mass M_E and M_2 to be the mass of a small object, this unnecessarily restricts the realm of phenomens. The less restrictive assumption is $M_1 + M_2 = M_E$.

Utilizing this latter equation has enabled the development of the Geophysical Weight Loss Diet. The lignre is a plot of the expected weight changes. Do not fear the initial weight gain, for, as the curve shows, a final weight loss is guaranteed!

The Diet:Week 1, Consume herds of cattle, devastate crop fields. Week 2, Pillage villages, farms, and lay waste to the countryside.

Week 3, Develop a taste for small mountain ranges, gorge your thirst on great lakes. Week 4, Delight on crustal dining, sample the refreshing taste of a small ocean. Week 5, Enjoy more of the pie, taste the mantle below the crust, pibble on the care

Week 6, Work your way through to the nther

NASA Goddered Spin e Flight Center Greenbelt, MD 20771

predictable tumbling, and came "close, but no turning like a very slow and steady top. Now, eigar," according to commander Robert Crippen, before getting word that technicians at because of the docking jults and Nelson's un-Goddard (Solar Max's command center) believed they could stop the satellite's rotation els, it was turnbling more rapidly around all from the ground. three of its axes. The even tried to grab the

longer pointing at the sun, Sidar Max's onboard batteries were draining without recharging. After shutting off all the spacecraft systems they could space, including the heaers for the science instruments, the Goldard What followed was a day-long race to get the spacecraft under control before it ration team actioned magnetic tempter bars in the spacecraft that act as a kind of level against

2 x 111³⁵

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M_E 2 MASS

TIME, WEEKS

side; no need to worry about iron pills.

Week 8, Finally enjoy the colume and food of

the antiquales. As with many diets, there are some side

Week 7. Watch those pounds disappear.

ellects. The worst appears that there is

becomes an astronomical gastronomel

onthing left to eat at the end, unless one

Acknowledgement. The benefits of this ap-

proach were discussed with Kwing Chan,

Dick Goldherg, Hans Mayr, and Nathan

Miller et al. during a Chinese New Year's

Kennetit Schauen

Salen Rodution Office

satellite with the shuttle's arm despite the un-Sections of the

Surface wave tomography is being used to map the seismic velocity and anisotropy of the upper mardle on a global basis [Nataf et al., Anisotropy and shear-velocity heterogeneities in the upper mantle, Geophys. Res. Lett., 11, 109-112, 1984].

Seismic Cross

Upper Mantle

The color figure shows cross sections of the upper 670 km of the mantle. (Note previous example published on the cuver of Ess. April 17, 1984.) VSV is the velocity of vertically po-

larized shear waves, averaged with respect to azimuth. The prange regions are slow, pre-sumably hot, regions of the mantle, although V5V can be low due to crystal orientation, or anisotropy, as well as to high temperature. The ambiguity is removed by studying the anisotropy. The parameter XI is related to VSH-VSV, the difference in relocity between the two polarizations of shear waves. Olivine crystals oriented with the fast axis in the horizontal plane would give positive XI. This would be the expected situation for horizontal flow. Vertical flow is expected to give neg-ative XI for an olivine-rich mantle. The cross sections for XI, with this interpretation, would be orange in regions of ascending and

The cross sections are labeled with the parameters of the great circle, right latitude, longitude, and azimuth. The horizontal line across the center of the map is the great circle of the cross section. The horizontal lines in the cross sections are at depths of 60, 220, and 400 km.

Note the deep, 400 km, slow anomalies un-der the Afar triple junction and the East Pacific Rise. The apparent sources of the muloceanic ridges are often offset from their surface expressions. The fast material at depth under South America, the south Atlantic, and the western Pacific may represent material that cooled at the earth's surface. The threedimensional character of mantle flow is evident when viewing many of these cross sec-

thurs. The mid-Atlantic ridge appears to be shallow on these cross sertions but can be traced to greater depth in other sections. This suggests that there is large lateral transport of material between source and ridge.

of power, because mow that its pagels were no

Tomographic reserce han Caltech is suppented by National Science Francation grants EAR-8115236 and EAR-8317023.1 thank Robert Clayton, Bradford Hager, and Adam Dziewowski har assistance in making

The news item and planta was contributed by Don. L. Anderson, Secondogical Laboratory. Galifornia Institute of Technology, Pasadena, CA



the earth's magnetic field, a crucle form of backup attitude control. At first the engineers thought this was working. Sonn, though, it became apparent that the satellite's gyruscopes were being overluaded by the high rates of motion and were not giving the proper information about the spacecraft's poition to the torquer bars.

Once the Guddard team realized this problem, they devised a new plan. By telemetry command, they dumped the satellite's onboard computer and sent up a new attitude control program called "B-Dot" that used magnetometer rather than gyroscope data to sense the spacecraft's position. This trading of programs took nearly 3 hours to complete, but it worked; the torquer bars almost immediately began to steady the satellite.

Now there was a new worry. B-Dot was very good at absorbing monientum, but it didn't allow for any attitude control from the ground. The Goddard team had no way to get the solar panels pointed back at the sun. Meanwhile, the batteries were losing energy with each nightside pass. Finally, drained to about 225 watts of power, Solar Max was not expected to live much longer than one more period of darkness. Ground controllers orned off the satellite's onboard radin transmitter just before it entered eclipse again in a last-gasp attempt to save another 25 watts,

and then they waited. Miraculously, when the spacecraft came into sunlight again, its solar panels were fac-ing the sun enough to begin recharging the batteries. With each succeeding orbital pass, the sun angle got a little better and the batteries a little stronger to the point where ground technicians were able to reload the original computer program, reestablish atti-tude control, and point the panels toward full sunlight. By morning the power was up to 100%, Solar Max was again turning neady at the rate of one half a degree per second (slow enough for the shuttle arm to grapple), and the Goddard engineers were able to relax for

the first time in what had been a very long 24

The Weekly Newspaper of Geophysics

for speedlest tteatment of contributions send three copies of the double-spared manuscipt to one of the editors named below and one copy to

Editor-io-Chieft A. F. Spilliaus, Jr.; Editorei Mircel Ackerman, Mary P. Anderson, Peter M. Bell (News), Bruce Ooe, C. Siewart Clilmor ory), Clyde C. Goad, Arnold L. Gordon, Louis J. Lanzerotti, Robert A. Phinney: Manag-log Editore Michael Schwartz; Nowa Writers Barbara T. Richman; News Asslatant Tony Reichhardt; Productioo Stafft One Sung Kim, Patrida Lichiello, Lisa Lichtenstein, Cynthia T.

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American Geophysical Union 2000 Florida Avenue, N.W. Washington, DC 20009

Cover. The AGU and its logo are now a part of the Washington skyllne and are prominent features on Florida Avenue, N.W., and nearby Connecticul Avenue. Those of you who have been contributing to the future of AGU can now see some langible evidence of these investments. Of course, the real action is on the inside. If you are in Washington, D.C., and in the neighborhood of the building, come innide, go to the eighth floor, and see the plaque bearing the names of the major contributors to the AGU GIFT Fund. If your name is not on this list, the GIFT fund Steering Committee would be very pleased to add it. The plaque is a proud ymbol of the esteem AGU elicits from it nembers as is the Headquarters building in which it resides. (Photos by Cynthia Bravo. AGU logo designed by Dae Sung

..And 6 More Years of Science

After these heroics, the rest of the repair mission went more or less according to the lamended) script. The crew was able to retrieve the satellite, fix its attitude control system and coronagraph/polarimeter instrument as planned, then redeploy Solar Max in its 500-km high orbit on April 12.

Barely was the satellite back in service again when it got the chance to observe the eruption of a major solar flare, through what Solar Max project scientist Bruce Woodgste calls 'a combination of anticipation and rapid re-pointing." The satellite had been near the middle of a 30-day engineering checkout pe riod when, on April 23, the onboard hard X ray burst spectrometer began detecting flare bursts in a particularly active region on the sun. Project scientists then requested God-dard technicians to move the satellite and point its narrow field instruments at the active region, with the result that half an hour lster the satellite was perfectly positioned to record the largest flare of the current solar cycle occuring on the sun. "We got lucky there," says Woodgate. So Interesting were the data returning from this flare region that Solar Max was scheduled to remain in its "science mode" for about 2 weeks before picking

up again with the engineering healthchecks.

Once it returns to full-time science, the satellite is expected to return data until it reenters the atmosphere, probably sometime in 1990 or 1991. Although it was launched primarily to study solar flares, in its second incarnation Solar Max will divide its observing time more evenly between flares and odter solar phenomena. Prominences-long streamers of mass exploding untward from the sun's limb (edge)—will be studied in a viewing pro-gram coordinated with ground observatories in Hawaii, California, and France. The satellite will also continue to monitor the solar constant, or total energy output that reaches earth (which it saw to be declining in 1980). and will take daily or near-daily images of the corona so that scientists can have a record of its changing shape at different periods in the

One of the more intriguing problems to be tackled by Solar Max involves the high-energy gamma ray emissions from solar flares cen by the gamma ray spectrometer in 1980. The gamma ray results showed flares with nuch higher energies and faster "rise times" than had been previously expected. In fact, no current theory of particle acceleration can explain them. Before Solar Max, only lower energy gamma rays with rise times of minutes (as opposed to less than 3 seconds) had been seen streaming from the sun. "We need to work on theories to explain how this energy rise can happen," says Woodgate.

A windfall of Solar Max's revival after 3

years of dormancy is that scientists will now be able to interact more closely with the satellite in real time, thanks to NASA's Tracking and Data Relay Satellite System (TDRSS). The satellite link is expected to allow observers on the ground to change viewing modes or repoint Solar Max instruments in near-immediate response to events happening on the sun, something they could not do in 1980 when the TDRSS wasn't in place. "With a person in the loop," says Woodgate, "we'll be able to do more pattern recognition" of features and rapidly occuring events on the sun.

The son is not the only target in Solar Max's viewing plan. When Halley's comet swings around the sun in February 1986, sev eral instruments, including the coronagraph/ polarimeter repaired by the Challenger crew, will return data and visual images of the com-

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et and its attendant tail. Solar Max will observe Halley from early January to late March, both before and after its closest sun approach, at a time when ground observation will be difficult if not impossible. A liest of

Hslley-bound spacecraft will take much closer looks in March, but for a period of about 2 months in early 1986, says Woodgate, "we will be the only observatory that will be able to observe the comet."-TR

In Congress

Legislative Update Senate ARCTIC RESEARCH AND POLICY ACT, H.R. 2292 Passed June 27, 1983 Passed April 24, 1984 (Young, R-Alaska) and S. 373 [Murkowski, R-Alaska), would provide comprehensive national policy dealing with national needs and objectives in Arctic and would provide a rentralized system for rollection and retrieval of scientific data, establish priorities, and provide financial support for basic and applied scientific research. ARTHQUAKE HAZARDS REDUCTION ACT, H.R. 2485 P.L. 98-241 P.L. 98-241 (Walgren, D-Pa.) and S. 820 (Gorton, R-Wash.), now public law P.L. 98-241, authorizes \$67 million for fisral 1984 and a 5% increase for Inflation for fiscal 1985, S. 820 passed the Senate April 7, 1983, and passed the House Feb. 1, 1984. Signed into law on March 22, 1984. EXCLUSIVE ECONOMIC ZONE IMPLEMENTATION ACT, Hearings to be scheduled H.R. 2061 (Breaux, O-La.) and S. 750 (Stevens, R-Alaska), would implement 200-mile EEZ adjacent to the U.S. territorial sea. Would also set forth U.S. policy on development and use of the natural resources and ocean floor. H.R. 2031 referred to House committees on Foreign Affairs, Interior and Insular Alfairs, Merchant Marine and Fisheries, and Ways and Means. S. 200 referred to Committee of the Commi 750 referred to Senate Committee on Commerce, Science, and ransportation, EXPORT ADMINISTRATION ACT AMENDMENTS, H.R. In conference 523 (Bonker, D Wash.) and S. 970 (Heinz, R-Pa.), defines re-strictions on the export of scientific and technical information. House passed its bill Oct. 27, 1983, and sent it to the Senate. S. 979 passed the Senate March 1, 1984, and passed the House March 8, 1984. A conference to iron out the diffesences was held April 12, 1984. Passed April 9, 1984 LAND REMOTE SENSING COMMERCIALIZATION ACT OF 1984, H.R. 5155 (formerly H.R. 4836) (Fugua, D-Fla.) and S. 2292 [Gorion, R. Wash.], aims to establish a system to pro-mote the use of land remote-sensing satellite data. Asserts that the private sector it best suited to develop land remote-sensing data markets and that cooperation between the federal guventuent and the private sector should be initiated now to assure continuity of data and U.S. leadership in land tenante sensing. A fully commercialized system should be phased in gradually, according to the bill.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINIS-Awairing fur-TRATION ORGANIC ACT, H.R. 3881 [Forsythe, R.N.J.), would establish NOAA as an independent agency and as the agency primarily responsible for providing occurric, roustal, and atmospheric services and supporting research (Eos. Sept. 6, 1983, p. 537). Would also establish procedures to avoid dupliproof, p. 301). Would also establish procedures to avoid dupli-cation of effort in these fields among government agencies. Re-ferred to two subcommittees of House Merchant Marine and Fisheries Committee and one of House Committee on Stienre and Technology, Several other bills that would establish a De-partment of Trade also call for making NOAA a separate agency. Merchant Madne Committee reported the bill out of

Passed Oct. 31, 1983 IATIONAL OCEANS POLICY COMMISSION ACT OP 1883, H.R. 2853 (W. Jones, D.-N.C.) and 3. 1238 (Hollings, D.-S.C.), would establish a 15-member commission that would develop recommendations for Congress and the President on a comprehensive national occans policy. S. 1238 referred to Senate Commerce, Science, and Transportation Committee. PEER REVIEW REAFFIRMATION, H.Con.Res. 257 (Sensen-Awaidng com

No companio brenner, R-Wisc., would realism "the commitment of the Congress to award federal funds for scientific tesearch projects and facilities solely on the basis of scientific merit as determined by a peer review process." Follows attempts by several universities to bypass peer review (Eos, January 5, 1984, p. 11. Referred to House Science and Technology Committee. (A ent resolution is used to express principles and policy.)

SCIENCE AND MATHEMATICS EDUCATION, H.R. 1310 To be scheduled Passed March 2, 1983 (Perkins, D-Ky.) and S. 1285 (Hatch, R. Utah). H.R. 1510 allo-cated \$425 million for mathematics and science education in fiscal 1984 (Bos, March 22, 1985, p. 114). Senate bill, which also would authorize \$423 million, was reported out of the Senate Labor and Human Resources Committee May 18, 1983.

SEVERE STORMS ADVISORY COMMITTEE ACT, H.R. 5207 (Hammerschmidt, R. Ark.), aims to assure that fore of severe storms within government agencies is coordinated for maximum benefit. Would establish a committee of no more than 12 members that would ecommend new programs, assess current forecasting programs, and make recommendations for incorporeting new technology developments into the operational forecasting system. Referred to a subcommittee of the House

WATER RESOURCES RESEARCH ACT OF 1984, S. 684 (Abdnor, R.S.Dak.), now public law P.L. 98-242, provides for the establishment of one water resources research and technolthe establishment of one water resources research and technology institute in each state and territory to "plan, conduct, or otherwise arrange for competent research with respect to water resources ...; promote the dissemination and application of the results of these efforts; and provide for the training of scientists and engineers through such research, investigations, and experiments." Passed the Senate May 28, 1983, and passed the House Oct. 31, 1983. President Resgan vetoed the bill Feb. 21, 1984. The Senate overrode the yeto (86 to 12) on March 21, 1984, and the House overrode the yeto (809 to 81) Morch 21, 1984, and the House overrode the veto (309 to 81) Morch 1984.

YEAR OF WATER, S.J. Res. 202 (Armstrong, R-Ohio), would designate 1984 as the Year of Water. Alms to increase awareness and dedication to the interests of worldwide water resources (Bot, March 20, 1984, p. 103). Referred to House Committee on Post Office on Post Office and Civil Service. Feb. 27, 1984

For additional information, contact the sponsoring Member of Congress or committee indicated. All congressional and committee offices may be reached by telephoning 202-224-3121. For guidelines on writing to a member of Congress, refer to AGU's Guide to Legislative Information and Contacts (Eas, April 17, 1984, p. 159). The last Legislative Update was published in the January 24 Bas.—BTR.

Vero overrid-

March 21, 1984

den March 22,

No compani

Ground Water Monitoring Technology: Procedures, Equipment, and Applications

Robert D. Morsison, Timeo Mfg., Inc., Prairie du Sac, Wis., xv + 111 pp., 1985, \$93.

Reviewed by Kenneth R. Bradbury

Over the past few years, increased interest in groundwater monitoring has resulted in numerous new articles about, equipment for, and approaches in the field measurement of physical and chemical groundwater parameters. Ground Water Monitoring Technology is a useful book that attempts to make sense of this recent information by organizing it into sections on monitoring the valose zone (part 1), unmituring the zone of saturation (pnrl 2), and groundwates sampling equipment (part 3). According to the preface, "A degree of discrimination was exercised in selecting techmologies which were directly applicable for field use." The book emphasizes "field prov-en methods which have been documented" at the expense of other prunising but unproven field techniques, and it omits laboratory methods except where required for instrument ralibration. Morrison is aware of the rapidly changing nature of current groundwater field techniques and has written the book so that it "will be useful even after a particular Instrument becomes absolete."

Ground Water Monitoring Technology is unt a "conkbook" of step-by-step instructions for lield investigations, nor is it a collection of case studies, Instead, it is a cumpilation of various field methods, each carefully documented by references to the literature, with The emphasis on equipment rather than technique. In fact, the strength of this book is the rollection of 481 references, which refer to monographs and periodicals in a number of associated scientific helds, primarily includ-ing, but met limited to, hydrogeology, hydrolngy, geophysics, sail science, engineering, and meteorology. These references alone are probably worth the price of the book. For each technique discussed, the nutlior briefly describes the theory and equipment involved. The interested reader can then go to the references cited to obtain more detailed information about a particular method or item of

Part I of the book, dealing with monituring in the vadose zone (55 pages; 380 references) is excellent in scope and clerall, and many readers may want to purchase the book solely for this chapter. Sections on soil moisture po-

tential, soil moisture content, soil salinity, temperature, and soil pore water sampling provide a good review of "traditional" techniques such as tensiometry, moisture blocks, electrical concluctivity probes, and vacuum pressure lysimeters, while introducing newer techniques such as Nuclear Magnetic Resonance and inductive electromagnetism, which may be unfamiliar to many readers. Profes-slonels involved in contaminant monitoring will be particularly interested in the section on soil pore water sampling, which discusses how various lysimeter materials (ceramics, nylon, fritted glass, Teflon) can affect the quality of water samples.

Part 2 adil resses monitoring in die saturateil zone (14 pages; 64 references), and includes sections on drainage systems, trench and caisson lysimeters, monitoring wells, well points, well clusters, multilevel samplers, hy-brid well systems (a combination of saturated and unsalurated zone monitoring), and piezoniciers. The strength of part 2 is its emphasis on new monitoring techniques, such as various multilevel samplers. The chapter is less allequate in its coverage of hydraulic head measurements, devoting only two pages and eight references to piezometers and ron-taining essentially no discussion of the precision and accuracy of various water level measurement techniques. In view of the extensive iliscussion of head measurement in the imsalurated zone and the importance of hydraulle hearl as the foundamental measurement in hydrugenlogy, these are curious omissions. In addition, there is no discussion of the applications of the various analog and digital water level recorders available today and which are often integral components of a groundwater

monitoring program.

The third part of the book contains a brief but adequate (10 pages; 37 references) discussion of water sampling equipment, includ-ing bailers, various suction and submersible pumps, and packer pumps. Once again there is an emphasis on how various sampler materials (PVC, stainless steel, Teflon, etc.) can affect water sampling results. The chapter could have been improved by including one or more tables summarizing the adequacy of materials and techniques for sampling various organic and inorganic chemical constitu-

Consultants and researchers involved in ernundwater contamination studies will find this book valuable. Most of the equipment described is best suited to relatively shallow in vestigations (on the order of o few hundred feet or less) and there is a strong emphasis on contaminant studies. Investigators interested in monitoring deeper groundwater systems or in water quantity studies may find the book less useful. The book is clearly written

and well illustrated with legible drawings and

Important Professional Reading...

Ninth International Congress of Carboniferous Stratigraphy and Geology

Volume 1: Official Reports

Edited by MACKENZIE GORDON, Jr. This was the first Congress to be held in the United States and it altracted more than 900 geologists from 29 countries. Highlights of this volume include a special lecture on the Carboniferous of China, a concise summary of the tectonic evolution of the Iberian massif, a short history of the founding of the Carboniferous System, an incisive look at world energy prospects for the next two decades, an outline of the geology of the Spanish Carboniferous coalfields, and a novel treatment of detail paleobotanical comparisons between west European coal basins and the Done1z basin.

High Sulphur Coal Exports

An International Analysis

Edited by MICHAEL M. CROW. Preface by SENATOR CHARLES PERCY and REPRESENTATIVE PAUL SIMON. The papers in this book were generated by the proceedings of the United States Senate Field Hearing and High Sulphur Coal Export Conference held in June of 1981. \$30.00

Blast Vibration Analysis

By G. A. BOLLINGER. This volume synthesizes theory and literature from seismological, geophysical, and engineering fields perlinent to blast vibrations induced by mining, quarrying, and engineering operations. \$6.95 paper

SOUTHERN ILLINOIS UNIVERSITY PRESS

photographs. A glossary provides definitions of most technical terms used in the book, illthough a few, such as "cortesian monostat," and, surprisingly, "monitoring," are omilled. Although the publishing company (Titnen) is in the business of selling groundwater monitoring equipment this book thankfully does not promote Timen predicts over the products of other firms.

Kenneth R. Bindbury is with the Wiscomin Geological and Natural History Survey, Madison, 17 53706.

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PUSITIONS AVAILABLE

The Colorado School of Milies. The Department of Geophysics of the Unborado School of Milies expects in have air opening for the ableutly year 1984–1985 for a caudidate with experience in coal geophysics, carthquake seismulogy or seismic risk. The Department emphasizes geophysical exploration and applied geophysics, and prefesence will be given by the caudidate who can bring that emphasis in his particular field of expertise. An extensive suite of field equipment and computers is available to support rescapt projects, and the Department aperates a seismic abservatory that it part of the world-wide tretwork. We expect that the appointment will be made at the Assistant Professor level; Innever, an accomplished scientis will a lack-ground in one of the at east of interest could be considered at a higher level. Please send applications, resumes anodor hopolies to: Philip 6. Roang, Professor and Head. Department of Geophysics, Colorado School of Mines, Golden, Colorado 80401.

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Postdoctoral Fellow in Atmospheric Science. A position will be available beginning Detober 1, 1984, at the Harvasd-Stoithsonian Center for Astrophysics for theoretical ansilyis of the Shuttle glow and studies of upper aumosphere physics and chemistry. A Ph.O., which imolved research in aeronomy, is required. Send applications and names of direc references to: A. Dalgamo, Center for Astrophysics, 60 Garden Strees, Cambridge, MA 62138.

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graduate level as well as maintaining an active research program.

The department houses a variety of facilities for petrologic research including automated X-ray diffraction and fluorescener units and an automated atomic absorption spettrophotometer. Other analytical services are available on campus including transmission and scanning electron microscopy units.

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Techoleal Specialist in Seismology. The Ceopliysks Group of the Department of Earth and
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Jacqueline Michel, Ph.O. esearch Planning Institute, Inc. 925 Gervall Street Columbia, SC 99201

Postdoctoral Ruscarch Associato Positions/Geophysics and Igneous Geochomistry. The University of Maine at Orono (UMO) has pustdoctoral openings for a solid earth geophysicis and an Igneous geochemist. We seek a goophysicist who wishes to advance fundamental understanding of past unit current thermal histories of the Appalachiam Orogen in New England and elsewhere. The geuchemist would be expected to investigate volcanic and plutonic suites in the Appalachiams in Maine and in other terranes. Current funding permits appointments for at least 12 mondis. Subject to arrival of anticipated funding, the appointments could start as early as August 1, 1984. Excellent facilities for geothermal research, computer applications, petrologic research and geochonologic studies exist at UMO. Additionally, limited funds are available for travel and research, and the appointmes of the encouraged to generate exterior support individually or through cooperation with existing faculty. Please send inquiries, a vita, a list of referees, and a description of research interests to Edward R. Oecker or Daniel R. Lux, Oepartment of Geological Sciences, 110 Boardman Hall, University of Maine at Orono, Orono, Maine 04469. Telephone calls may be made to 207-SS1-2152, and forwarded to Oecker or Lux. be made to 207-S81-2152, and forwarded to Occker

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Group in the Department of Oceanography has positions available in organic and isotope geochemistry. Ph.O. level personnel are primarily needed to
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Or. T.L. Killeen

Space Physics Research Lab.

Oepartment of Atmospheric and Oceanic Sciences

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Faculty Position to Planetary Science. A junior faculty position in the Ocpariment of Earth, Atmospheric, and Planetary Sciences at M1T is available for a recent Ph.O. graduate in the field of planetary dynamics. Applicants should have a solid background in classical releasial mechanics, as well as modern computer-assisted numerical theory, and should have demonstrated proficiency in attacking problems involving spin-orbit coupling and multibody orbital evolution. Individual must have a strong interest in teaching graduate and undergrad-

body orbital evolution. Individual thist have a strong interest in leaching graduate and undergrad-uate students. Applicants should submit curriculum vitae, a brief statement of research interests, and names of three

eferences tu:
Or. William F. Brare, Chairman
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Massachosetts Institute of Technology, Haystack Chiervatory/Atmospheric Scientist. The Haystack Observatory is accepting applications for an antiquated Atmospheric Scientist position for a one-year period, equivalent to a post-doctoral appointment, to work in the field of upper atmospheric physics with the Millstone Hill Atmospheric Scientes aroun The scientist will positionate in the application.

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J.T. Karaku Assistant to the Director Hapstack Observatory Westford, MA 01886.

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of Physics and the Center for Atmospheric and Space Sciences at Utah State University. Candidates should have a Ph.D. degree in theoretical and/or experimental aeronomy/space physics. Experienre in the following areas will be advantageous: experimental optical spectroscopy, theoretical modelling of the chemistry and dynamics of the stratosphere/mesophere; theoretical modelling of the their mosphere/inosphere. Opportuolities exist to participate in stratospheric balloon, Space Shuttle and satellite flights, in the design and fabrication of experimenta, and in data analysis and theoretical modelling. A comprehensive database of terrestrial emissions covering the extreme ultraviolet to the near infrared, and extending from the surface of the earth to the thermosphere, was recently acquired on Sparelab I, providing significant data snalysis opportunities. The group is also involved included the photochemistry and dynamics of the thermosphere/plasmasphere. It is planned to extend the modelling work to the stratosphere and mesosphere in support of balloon measurements of key interested persons should submit a resume and

Interested persons should submit a resume and the names of three individuals who can be ronjacted for reference purposes to:

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Applicants should send their resume and the rame of three references by June 1, 1984 to E. Hoskins, Ocuariment of Geophysius, Texas A&Al University, College Station, TX 77843.

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¹⁸Be and other rare isotoper in samples of arientifal interest, and for research on applications of accelerator mass spectrometry. Half of the time on the Facility is reserved for collaboration with off-site users, and the other half is used for in-thouse research programs. The person hired for this position will be responsible for physica aspects of the landem accelerator and associated equipment, and will have the opportunity to develop research programs milizing the Facility. Salary will be commensurate with experience. Available new, Contact Professor D. J. Donolme, Department of Physics, University of Arizona, Tutson, Arizona 85721 (602-621-2480).

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Special Doctoral Research Assistantiships. The Department of Oceanography of Old Dominion University has several special doctoral research assistantiships ovailable for Fall Semester, 1984 and 1085. These earry a stipeoil of \$7,000 per academic year, renewable for three years. Applicants with M.S. degrees qualify for waiver of tultion. Students interested in characteristic period of the Ph.D. in the areas of himingical, shemical, geological, or physical oreanography should send an introductory remote to Dr. Ronald E. Johnson, Graduate Program Director, Department of Oceanography, Old Dominion University, Nurfolk, VA 23508.

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Optical Aeronomy Workshop II

The second annual workshop on ground-based optical acronomy will be held in Ann Arbor, Michigon, hils summer on 20-22 June, 1984. Two topics, optical detector technology and possible ways and means for improved applications of theoretical models, will be the central issues of this meeting. A total of it invited papers covering various types of optical detectors and ibeir applications will be presented on the 20th. ond similarly, another set of 10 to 12 in-vited papers on theoretical topics will be given on the 21st. There will be adequate time provided for discussion throughout the two sessions. These two areas will be reviewed by panel discussions on the morning of June 22. Some travel support will be available. Please write to Mrs. Joan Eadle, University Extension Service, University of Michigan, Ann Arbor, Michigan 48109, for

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Meetings

Announcements

Nuclear Waste Management

November 26-29, 1984 Symposium on the Scientific Basis for Nuclear Waste Management, Boston, Mass. Sponsor: Materials Research Society. (John Stone, E. I. du Pont de Neniours and Co., Savannah River Laboratory, Aiken, SG 29808.)

Abstracts for contributed papers are due une 15, 1984.

The sympositum on nuclear waste management is one of 17 that will take place at the Fall Meeting of the Materials Research Society. A program of one- and two-day short

courses will complement the science and terhnology presented in these symposia.

Landslide and Flash Flood Hazards

June 14-15, 1984 Conference on Delinea-tion of Landslide, Flash Flood, and Debris Flow Hazards in Utah, Logan, Utah. Sponsors: Utah Water Research Laboratory, Utah State Univ., Utah Geological and Mineral Survey, National Research Council Gummitice on Natural Disasters, and Utali Science and Technology Council. (David Bowles, Utah Water Research Laboratory, Utah State

University, UMC 82, Logan, UT 84822.)
This specialty conference is intended to assemble descriptive information about land-

slides and alchris llows in Utah that caused mure than \$25tt million worth of damages in the spring of 1983 above. The outference is a formin for scientists and engineers to exchange data so that they may be better prepared for these destructive events in the fu-

Papers will be presented thiring the conference on quantitative methods for mapping flood, debris, and landslide risks below munitain slopes, and on manitoring programs and warning systems for these hazards Specific topics to be discussed include: soil and water conditions that lead to landslides and debris flows, instrumentation for hazard monitoring, damage analysis and dennup, land use in hazard areas, frequency analysis of debris flow events, and social, political, and legal aspects of emergency and remedial pro-

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Oceanography

Reply (Paper 480055)

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FFG] and 6. Gravashorst
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Stephen H. Kirby and Andreas K. Krontoburg

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Kalhematics, Quees Mary Goilege, Nate End Road, London

O. Dargess and S. J. Schwarts (Deportment of Applied Mathematics, Quese Mary Golley, Mits End Mond. London Ei BEJ, Englandi
Dainy isst particle tespectories in a simplified model of a supervitaboak, oblique, collisionless whook we threatiges the interaction of sclor wind thermal tens with the asith's bow shock. We present westifs for shooks with shook angle (Pgm. belives he and 80° and show that the deserties of the tesbeoks fones and their velocity space algosities are consistent with characterious of many upstream one events, particularly gyrating toss and fisionsigned ton beams. The shoch is socialist as a finite, planate Otscontinuity in the magnetic itels and in the sicatrostable potential, which is also given an overshoot at the shock. We find that the shock on preduce berkstreaming ions by reflecting a small traction of the incident distribution. The deserty of these respected ions depends on the temperature of the clairinuiton, the strength of the shock at the potential jump, and the geometry of the shock. The collected particle signaturies are of three types, specularly redicate, multiple traversal, and multiple bounce. All reflected ions are found to subfer specular retreation on their tirst encounter with the shock extraces, their subsequent behardour is Getermined by the angle \$g_m\$ and their initial conditions. (Now shock, Tess particle elastications, reflected ions)

beam-cyclotron leatability piecess. We estimated the beam wedsclip from the solar wind paissalors using the bonners of founds. One can large supports the hypothemis that these waves are excited by the resonant beam-cyclotron instability. For the waves observed to the deep foreshock region, however, we found is accessary to include the solar wind convection effect on the wave propagator.

5730 Hagneris Coordinate Systems
TEMPORAL VARIATIONS IN THE SIPIE STATION COMJUGATE AREA
E. G. Stasminopoulous (RASA Goddard Space Flighs Center,
Breenbett, Maryland 2077); L. J. Lanstrotti and
T. J. Rosenberg
The Sipie Station conjugate incations in the northere
heal sphere are examined for the epoch 1975-1990 eccording to the predictions of three internal sources
geomognesic field models (1987-80, NAGSAI-80,
Barractough-75) and one externat field endel (MeadFairfield) under quiet and disturbed annations. The
conjugate location systematisally changes in the
internat studied, making is impossitive thei changes be
made in the locations of the northern healsphere geophysical stations dering the re-scituation of Sipio
Similar in 1985-1987.
J. Onsphys. Ecc., A. Papec 4A0370

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